

Evolution and Human Destiny: Reflections of the Author Sixty Years after writing the Book.

By Fred Kohler

It is almost sixty years since I wrote *Evolution and Human Destiny*, yet when I reread the introduction it still appears substantially valid. This enduring validity is surprising to me, as so much has changed in the daily lives of billions of human beings, and we have moved towards an increasingly global society. Still I would change little of what I wrote in that introduction. This tells me that while the problems confronting humanity have changed, they may have become more intractable. A painless transition towards the human future is far from assured and may be disrupted by major catastrophes.

While being a short term pessimist, I remain optimistic about humankind's long-term future. Approximately two thousand years ago when the Library of Alexandria was burned, perhaps 75% of accumulated knowledge was destroyed; now the spread of human knowledge is so ubiquitous that if all civilization were destroyed except for New Zealand, about 95% of accumulated human knowledge would be preserved in the libraries and the computers of that country, and civilization could be rebuilt.

The Cold War, which had just begun at the time I wrote the book, ended more benignly than I expected, yet nuclear weapons are still in the arsenals of an expanding number of nations, though they currently do not threaten instant Armageddon for human civilization. However the potential abyss I mentioned in the book's introduction is still with us, although perhaps less imminent. Citation of only a few of our current problems would certainly include overpopulation, climate change, nuclear proliferation and depletion of natural resources, just to mention the most serious ones. Overpopulation is in my opinion the most serious problem confronting us, and failure to address it makes a benign solution of our other problems almost impossible. Human society itself has taken, what seems to me, a surprisingly long step towards the societal organism that I had envisioned in *Evolution and Human Destiny*.

Much of the Biology in the first half of my book is now obsolete. It was dated even at the time I wrote *Evolution and Human Destiny*. Let me confess that I did not engage in sufficient research before and during that time period. I was too excited by what seemed to me a seminal conceptual insight into the transformation of the human evolutionary future that was taking place almost without being noticed by the participants. Nevertheless, I am now far more certain that my general thesis and prediction of the way in which the human species will evolve, provided we avoid the abyss, is largely correct.

At the time I wrote my little thesis it was not read or accepted by many evolutionary biologists, sociologists or anthropologists. Today the concept that human society is developing into the societal organism which I conjectured is no longer strange. That

concept is now called the global organism, or global super-organism, but it is still not widely understood that this development is consistent with other consolidations that have occurred in the history of the evolutionary process.

Let me express my opinion why there is such reluctance among well-educated people to face the evolutionary implications of the ongoing transformation of the human species. I suspect that the principal reason why there is so little appreciation among those who otherwise accept the Modern Evolutionary Synthesis is due to the lack of appeal of the idea that one would be just a cell in an organism, or like an ant in a social colony.

A notable exception to this is a book written about twenty years ago by Gregory Stock entitled *Megaman*. I recommend this book, although the author cites so much convincing evidence that an emerging global super-organism is currently in development that the evolutionary biological connection of this phenomenon, which Stock fully understands, becomes somewhat submerged.

Apprehension of the concept of a global super-organism is understandable, but is not really justified for the following reasons. A cell, which does not have a brain, is two or more levels of consolidation less complex than human society; the number of neurons in the brain of an individual ant or bee is about one million compared with the estimated one hundred billion in the human brain, a ratio of 1 to 100,000; the number of potential synapses is exponentially larger. Consequently, human beings with their big brains will never be like insects in a hive or colony. The status of an individual human component in the evolving societal organism is unclear—it is endowed with all the unpredictability that is characteristic of emergent properties, but that organism exhibits a new and unprecedented feature: this emerging human societal organism is subject to an increasing degree to its own conscious control.

There is little doubt in my mind that the status of the individual will be increasingly different from what it is currently. I suspect that there will be substantial differentiation among individuals; the meritocracy that is becoming characteristic of the advanced countries, as well as of those currently undergoing fast technological development, provides a preview of what I expect to happen. In the earlier stages of our rapid march towards the global super-organism a high degree of specialization will probably be deliberately induced by the almost inevitable genetic engineering that will be possible—and probably become routine—in the foreseeable future. Note: I wish to remind the reader that *prediction is not advocacy*. I am fairly sure that were I suddenly projected into humanity as it may exist some thousands of years from now, while finding this viewing fascinating, I do not believe that I would be very happy living in the society that I predict coming into existence.

Projecting much further into the future is at best a guess. In the more distant future we may or may not merge with the artifacts we created, or be partially or totally replaced by our creations. Carbon-based life may prove to be unsuitable for colonization beyond our

solar system. Re-affirming what I had written in my book, our artifacts should be considered to be constituent parts of the societal organism. It also seems probable to me that the psychological makeup of humans living in the future will gradually change as they become conditioned over generations by living within the evolving societal organism. It is interesting to note that the inevitable changes in human emotions and attitudes are usually not portrayed by current science-fiction predictions of the future. We project ourselves easily into very different technological futures, but we shy away from envisaging profound changes in the human psyche.

It is only in the past two-hundred and fifty years that most human beings living into their senior years are experiencing an environment very different than the one in which they spent their youth. Prior to that time the conditions of life changed on the average very slowly. There were, of course wars and epidemics, as well as natural disasters, but what individuals learned in their earlier years did not become obsolete during their lifetime. For at least the past three generations much of this knowledge has become dated some sixty year after it was acquired, or even sooner.

If you have problems using your computer get help from a teenager! The younger generation in the technologically developed countries, as well as in many developing ones, now grows up with cell phones and computers and rarely realizes how recent they are, nor how much scientific and technological work went into making these advances feasible. Although they were made possible by outstanding individuals, no one person knows enough to build any of these marvels even with the assistance of many helpers. These devices are in a real sense products of an increasingly integrated society, well advanced, on its path towards becoming the societal organism predicted in my book.

At the time I graduated from Cooper Union, an Engineering College, in 1942, I considered myself fairly knowledgeable in regard to technology and science. On an undergraduate level I understood Chemistry, Mathematics, Physics and some Biology. Overestimating what I knew as an engineering graduate may have been my personal misconception some seventy years ago.

If a time-traveler from the future had shown me the laptop on which I am typing this essay, had demonstrated its power and told me that a billion people on the planet will have such a device in the future, I would have said, "Well, maybe in five-hundred years." Further, if this fictional person had informed me that the human genome as well as those of many other animals and plants will be deciphered and that those genomes are made up of billions of molecules of four nucleic acids - and then had asked me to estimate how long I thought it might take to accomplish this wonder, I would have answered maybe a thousand years, maybe never. And I would have been dead wrong. Never would I have believed that this could be accomplished in my lifetime. Of course the flying commuter cars, as well as power too cheap to be metered that were predicted have not become part of our world. Predictions of scientific and technological developments, optimistic as well as pessimistic, tend to be hazardous

Very few of the generation that grew up with computers and even the generation born after 1945 have only a faint idea how little, of what they take for granted, was in existence in 1942. The most advanced computer, constructed in the middle 1940's was an unwieldy monster that occupied an entire air-conditioned room and had twenty-five thousand active vacuum-tube elements requiring a constant attendant to replace the tubes that failed. Now the one-square-inch chip in my laptop has millions of reliable, active elements. In 1942 there were no such things as micro-processors; not even single function transistors. The Manhattan Project, which succeeded in producing atomic weapons, had rows of women sitting at mechanical calculators spending days performing calculations that would take only seconds on my laptop, assuming an applicable software program had been provided.

The state of genetics was equally primitive. Biology texts (textbooks usually are at least ten years behind the cutting edge of knowledge) still claimed the human complement of chromosomes was 48 instead of 46. I recall looking through a school microscope at a cell and being barely able to distinguish the individual chromosomes. It was known that each chromosome consisted of many genes, but there was no consensus of what they were at the molecular level. Although it was suspected that they consisted of nucleic acids; my antiquated biology text still guessed that they were proteins. The thought of deciphering the detailed composition of each gene, especially if we had known then that there are thousands of genes on each chromosome and as many as some twenty thousand codons per gene, would have been far-out science- fiction.

(A codon consists of three nucleic acid molecules, out of an alphabet of four; codons generally specify the specific amino acid that is to be used by the cell for protein synthesis. There are over two billion coding nucleic acid molecules in the human genome, but most do not specify amino acids: those not involved in protein synthesis have regulatory functions, though many of these nucleic acids appear to be “junk” DNA).

Detailed knowledge of the human genome as well as that of an increasing number of other organisms is now just one aspect of our current scientific reality. This knowledge would not have been attainable without our powerful computers which will become even more sophisticated and powerful in the near future. When the human genome project was initiated in the 1990's it was expected that it would require many years as well as the expenditure of billions of dollars, and so it did. Currently a complete human genome can be deciphered in weeks for less than a few hundred thousand dollars and that price is falling rapidly, which is just an indication how fast we are moving technologically, but beware: many of the predictions of current science fiction will not come to pass.

In addition to the many dangers confronting human society I foresee a problem that I shall call the “Science Tower of Babel Dilemma”, where scientists working in different scientific disciplines are unable to understand or communicate with one-an-other. This will no doubt be mitigated by the fact that the computers, servers and connecting

channels comprising the internet have become an effective and increasingly comprehensive societal memory, as well as making collaboration and communication of advances fast and easy. Furthermore, the tendency of complex dynamic systems to self-organize is now recognized, though not yet well understood.

Perhaps my apprehension about the dire consequences of individuals working in different scientific and technological disciplines not understanding each other and the problems of coordinating their activities is a reflection of my own growing discomfort with no longer understanding the science and technology underlying the gadgets that I use every day. I must admit that my lack of understanding doesn't stop my computer from operating with surprising reliability. The problem may not be as serious as I fear, as this Science Tower of Babel Dilemma has been with us at least since the last Renaissance man died, if he ever existed. Yet technological advance has been steady in the long run and lately has become exponential.

I wrote *Evolution and Human Destiny* in 1950, about eight years after I graduated with a degree in Chemical Engineering. I wanted to make use of what I had learned and tried to apply the concept of entropy to the evolution of life; that was a mistake. Applying entropy to living organisms really involves great difficulties. However in terms of its principal thesis the book was prescient.

With the hindsight resulting from giving the problem of describing the direction of the evolutionary process much thought and exposure to the views of biologists, I now wish I had described the direction of the evolution of living organisms as a process that explores *paths in all directions*. Not that all these paths will lead to greater orderly complexity; however the path leading to an *increase of orderly complexity is one those directions*. When a high degree of orderly complexity has been reached by some species, an even higher level will occasionally be gained, by evolution taking that same random walk it always takes. The appearance in time of increasingly sophisticated organisms is a result of this random process, and does not require intention. I shall not attempt to define orderly complexity by a mathematical formula, which tends to be very difficult and controversial. Neither do I want to expound on evolutionary theory, as there are many excellent books on that topic.

I am of the opinion that differences in the quantitative and especially in the qualitative levels of orderly complexity in living entities are usually fairly clear. For example, few scientists would refuse to accept that the orderly complexity of organized human society is considerably higher than that of a troop of chimpanzees. Obviously the complexity of a mature human brain is greater than that of an ape. To this substantial difference one must add the much greater orderly complexity of human society, which is both qualitatively different and quantitatively higher. One can easily see by this simple example how difficult it would be to put numbers on these differences, yet some evolutionary biologist with math envy, or some mathematician who thinks he/she knows Biology surely will attempt to do so.

I believe this simple example shows why the quantitative use of entropy is not useful in application to living forms. As an organism ages its entropy certainly increases; it increases at an accelerated rate when it dies and decays. However, life is based on a very *special* kind of orderly complexity which is neither randomness nor simple order. I reaffirm the utility of the word *extropy* which I used in *Evolution and Human Destiny*, as long as it does not stand for negative entropy and merely denotes the *special orderly complexity* that is characteristic of life. Extropy should not be equated with an *elan vital*, which is a concept that has not been accepted by science for at least a century. The laws of Chemistry and Physics are not violated in living organisms, and life will almost certainly be created in the laboratory in the foreseeable future.

Chaos Theory, which was in vogue some thirty years ago, correctly states that life exists at the border of order and randomness. That insight though superficially valid, did not prove to be very useful. Now that I have re-introduced readers of this essay to the word *extropy*, I shall use it instead of orderly complexity, but be reminded that it stands for the *special* kind of orderly complexity that characterizes life. The *Santa Fe Institute*, which has some of our best scientists on its faculty, has toyed with more than thirty definitions of that complexity; none were fully satisfactory, so forgive me for not attempting my own definition. (Murray Gell-Mann in *The Quark and the Jaguar* provides an excellent overview of the problem of defining the complexity of life)

Maintaining a high level of that extropy is difficult in a universe where order tends to decay. This decay of order is best explained as a consequence of the mathematical fact that random arrangements are far more probable than orderly ones. Preserving and reproducing the very special orderly complexity that characterizes life calls for innovative strategies assuring maximal reproductive success, which are well described by current theory known as the Evolutionary Synthesis. These strategies and environmental circumstances will lead on rare occasions to the consolidation of already quite complex organisms into a higher level of organization with emerging qualities that could not have been predicted. Obviously this integration requires thousands or even millions of generations. Such an integration of individual life forms into more complex entities has happened several times during the evolution of living organisms.

A similar, still ongoing consolidation has made the human species what it is now and what it will become. This process of consolidation to form organisms on a higher level of extropy appears to be a not-too-well understood occurrence in the evolutionary process. In the human species the crucial enabling factor was the acquisition of symbolic language emphasized in *Evolution and Human Destiny*. In that book I neglected to mention that upright posture and the opposing thumb developing during roughly the same time period were also of great importance, because together they enhanced the advantages of intelligence in achieving greater reproductive success. This highly improbable circumstance led by the means of a self-reinforcing process to a large brain. This development must have been of considerable reproductive advantage, considering the

nearly seven billion human beings living currently on this planet, as large brains are biologically and metabolically very expensive.

While reproductive success is the principal selection factor in the evolutionary process, the same is not true for the sub-units integrated into organisms. When cells reproduce wildly and in a disorderly way in multi-cellular organisms we term this cancer. In the evolving human societal organism when population outgrows available resources it is called over-population, which has to be checked by our own decisions, or nature will do it for us and that will not be pleasant.

Scientists are aware of a more encompassing hierarchy of orderly complexity in the evolution of matter extending back much farther in time than the evolution of living forms. This hierarchy has been recognized as going from sub-nuclear particles, to nuclei, to atoms, to molecules, to macro-molecules with autocatalytic properties, to cells, to cells incorporating other cells, to multi-cellular plants and animals, to societal organisms, such as the human species is in the process of becoming. I realize that I have left out ecosystems; this is deliberate. I do not underestimate their importance, but I do not consider ecosystems to be members of that hierarchy, nor are they organisms. Neither do I subscribe to the Gaia hypothesis which regards the entire planet earth as a living organism.

Maintenance and reproduction of the extropy that comprises life always calls for energy flow from outside the living organism and an increase of disorder somewhere else in the universe; thus, it is not a violation of the Second Law of Thermodynamics. Anti-evolutionists please take note. However the fact that it is possible at all seems to be built into the laws of nature and in addition appears to depend on a rather narrow range of values for the fundamental constants of Physics.

How did such appropriate laws and these life-friendly constants arise? Is there a purpose involved which explains why the universe has given rise to life and intelligence? These are extremely difficult questions to answer now, perhaps for a long time to come and possibly forever. I shall now express my very personal views on this highly controversial problem.

Religions are gradually getting around to accepting evolution, but assert that evolution is either directed by God, or if not directed by God, they may retreat to just calling it the Creator-god's method of creating. Taking the latter approach seems to me to be their better choice, because it solves the historical theological problem of why there is so much misery, evil and injustice in the world. If evolution is God's method of creating as well as of achieving a specific purpose, and if the creator either does not intervene, or intervenes only infrequently, the existence of what from the human standpoint is cruel and unjust cannot really be otherwise.

The theologians should be quite happy with the theory of evolution, because it solves one of their most intractable problems. Indeed in a certain sense they may have anticipated this solution when they proclaim that the occurrence of injustice and cruelty is only apparent, because we do not see the total picture the way God can. It is ironic that the godless scientists have provided a scientifically acceptable solution of this bothersome problem for the theologians.

The cosmologists who are also mostly godless have an answer to how it all began. They claim it started from nothing, because that “nothing” is unstable. If time and space are truly infinite, then there should be an infinite number of universes, each one with different constants and regularities. Life could only have developed in those universes that had the appropriate constants.

These values and conditions will happen in only an infinitesimal number of universes, but mathematics assures us that infinity multiplied by any number no matter how small will still be infinity. Or if there are merely an astronomical number of universes, the probability that some will be suitable for life can still be quite high.

The emergence of intelligence and even more so high technology and science requires a physical environment that seems to me, to be quite improbable. That environment must be stable, but not too stable and these conditions must persist over time periods of billions of years for evolution to function for a sufficiently long time so that intelligence has a chance to develop. We can live only in a universe that meets all these conditions. The requirement that all these pre-conditions must be right is known as the Anthropic Principle, which comes in a various versions. The weakest version merely states that a universe meeting all of these requirements is the only universe that could have produced creatures asking these questions. The strongest version claims that the universe could not have come into existence without the parameters making intelligent life possible, because according to the laws of Quantum Physics all physical objects, and this includes the universe, need observers to exist.

In my opinion the weak Anthropic Principle is necessarily true, while the strongest version is an absurdity, as the universe did exist unobserved for billions of years, before we came along.

So we start out with either nothing, or with an almost unimaginable intelligence with the executive power to create matter and energy from nothing including the finely tuned constants. The cosmologists’ version, which also starts from nothing, lacks empirical evidence and is contrary to all human experience which cannot imagine that absolutely nothing can become something. The concept of a God seems to me to invite a question in need of an answer. Or to put it even more plainly, little Johnny asks in Sunday- School, “Who made God?” Soon enough Johnny will learn that you don’t ask such questions.

You can also choose the conjecture that the universe was always there in some form and had no beginning in time. This hypothesis, as do the two previous ones, obviously invites the questions of how did it beget these life-friendly constants and laws? Why is there anything at all instead of nothing, and that gets us back to square-one. These questions have perplexed philosophers for millennia, but they have not found satisfactory answers.

Finally you can equate the totality of physical laws and all that exists with the concept of God—a form of Pantheism, but also the publicly expressed view of scientists and philosophers such as Albert Einstein, Stephen Hawking, Carl Sagan and Baruch Spinoza, who wrote some three hundred years ago *Deo sive Natura* (God or Nature).

Choose as you prefer, just don't kill one another over how you choose, because if you destroy civilization in the process we will end up never knowing. My personal conclusion is that answers to these questions are not possible at this stage of human development. At this time we probably don't even know the right questions.

Let me posit a simplistic example illustrating the nature of this dilemma: People are known to have killed each other arguing what came first, the chicken or the egg? The question as stated has no answer and no meaning. However today we know enough to ask the meaningful question: "How did the chicken and egg reproductive system develop?" Evolutionary biology provides a good answer. As recently as two hundred years ago the appropriate form of this question could not have been posed. Our ancestors of just a few thousand years ago were in the same position as the "chicken and egg contestants." They could not conceivably have asked meaningful questions as to what causes lightning and thunder, because their knowledge of the laws of Physics was non-existent.

Could anyone have predicted that the descendants of creatures similar to slime molds will some billions of years later decode their own genome and land on the moon? These accomplishments, from the time when slime molds were among the most complex living organisms to the internet, only took about one and a half billion years; so be a little patient! We may not have to wait that long. Our insights are currently increasing exponentially as we are becoming transformed into that societal organism. Even though we are currently increasing our knowledge at a dizzying speed, the question of how it all began and whether there is a hidden purpose may never be answered. I can live with not knowing, rather than accepting dubious answers from either theologians or cosmologists.

It is in our time that a product of evolution has discovered its own evolution. That it is possible for a minuscule part of the material of the universe to become knowledgeable of the structure, composition and history of the entire universe and of its own evolution including the details of its genome far transcends the miracles claimed by the world's religions. That a process starting from a volume smaller than the nucleus of an atom, of nearly infinite density and temperature (to the best of our current knowledge) was able to give rise to such self-reflective organisms as we have become is absolutely mind-boggling.

I like to think that the human phenomenon may be of deep cosmological significance. Perhaps we are an extremely improbable accident, but if so, *what an accident!*

What seems to me of extreme importance is that we preserve and advance such a unique occurrence, despite of all our failings and horrible misdeeds, which continue to this day. We do not know if we are the only form of life in the universe that has reached this level of consciousness—I suspect there are very few. It is entirely possible that we are alone in the galaxy and, though far less probable, in the total universe. Readers may have heard of “Drake’s Equation,” a formula which attempts to estimate the number of technological civilizations in the Galaxy or in the entire universe. It starts out using such relatively known numbers as, the number of galaxies in the universe, the number of suns per galaxy; the poorly known number of how many earth-like planets there are in existence per sun; the unknown number of earth-like planets with life and the totally guessed at number of how many of those with technological civilizations. (I left out a few additional factors)

The number that I would assign for earth-like planets and the number denoting the probability of life on these is much lower than guessed at by the conventional wisdom of most scientists. My estimate of the fraction of planets harboring life with high technological civilization is far lower than the estimates of most cosmologists. I am not all alone conjecturing that we may be the only form of life that has achieved our insights, our science and our technology in our galaxy and perhaps anywhere in the entire universe; there are some scientists who favor the “Rare Earth” theory. (Wikipedia, the on-line encyclopedia, features excellent articles on “Drake’s Equation” and on “Rare Earth.”).

Whatever the number of high-level technological societies turns out to be, and all estimates including my own are wild guesses, any measures promoting the survival of human civilization should be an absolute priority. The survival of other species, plants or animals is also important, but this should be secondary to the survival and scientific advancement of *human* civilization, because that civilization, which uniquely represents the tiny, tiny portion of the universe that has become conscious and self-aware, once destroyed, might never arise again. That does not mean that we should thoughtlessly trash nature, because other species are also unique, even if they are not self-aware and unlikely to reach the human level, at least as long as we are around. Many—perhaps most—of these other organisms are necessary for our own existence. We understand only poorly the web of life that sustains us.

The human phenomenon seems to me to be a stupendous event; letting it lapse would, in my opinion, constitute the greatest cosmic crime imaginable. Whether the human phenomenon is based on highly improbable, singular accidents, or inevitable, or somewhere in between these two extreme formulations, I do not know. To me, the human phenomenon is the most amazing and significant occurrence in the universe, at least since

the origin of life on earth and perhaps even transcending that interesting period of time. It is in our time that a product of evolution has discovered its own evolution, as well the history and makeup of the universe.

That product is human society and having achieved that insight we will change, at the very least, the further development of that product. Our evolution will in the foreseeable future not be the same apparently mindless process which has brought us to our present stage of development. To an increasing extent we will control our own evolution and perhaps eventually the evolution of other forms of life, as well as create life never seen before in nature. A change beyond all expectations of only a hundred years ago, but a change that is becoming reality!

Again, let me remind the reader that there is no way of denying that a minuscule part of the universe has become conscious in terms of every meaning assignable to this word. Does this imply that the entire universe is a conscious being? Perhaps for some New Age pundits, but I see no current basis for that belief.

Finally, I want to mention briefly, how the growing realization that my predictions about the evolutionary transformation of humanity are probably correct has affected the way I feel about my own life. As I will be ninety years old in just a few months, I have at this point in my life minimal ego-needs. As an adolescent I tended to read the word posthumous as post-humorous; I still think that seeking posthumous fame is a bit of a joke and a last vanity. I suspect that the reader of this essay has by now spotted me as a non-believer in regard to religion, but I am also skeptical of far-out cosmological theories when they are devoid of any empirical evidence. I do relate to one of the statements of Albert Einstein, namely: "All our science, measured against reality, is primitive and childlike, and yet it is the most precious thing we have."

I do not believe in any form of personal survival after death. To the extent that we survive in the remembrance of other human beings, which one of us will be remembered a thousand years from now? It is my opinion that very few humans alive then will have the slightest notion that most of us ever existed. Being dead for an hour feels the same to those no longer alive as being dead for a year, a thousand years, a billion years and for all eternity.

I was the only child of my parents, had no children of my own and have no close relatives who might propagate my genes. As human beings share 99.75 % of their genes, and the variable 0.25% of my genes is selectively carried by other human beings, I do not consider the failure to propagate my genes as a great loss to the world. In human society one can have effects on the future without transmitting one's genes. All of us affect the lives of others as we function in our own way in human society. In that sense I am confident that my life will have some effect on the human future.

I am glad to have lived and like to think that having been able to arrive at some insights, I consider myself as having been exceptionally privileged. Although the concept of comparing human society to an organism goes back to at least as far Thomas Hobbes' *Leviathan*, it is my belief that I may have been the first person who recognized and wrote about the evolutionary roots of this development. No doubt, had I not done so, someone else would have been the first. Gregory Stock certainly understands that evolutionary connection and wrote about it some twenty years ago; I am quite certain that he had never heard of me, nor read my book. Alison Jolly's more recent book *Lucy's Legacy* mentions that something entirely unprecedented is currently happening in the evolution of the human species.

Evolution and Human Destiny, with all its flaws, was used in Anthropology courses as reading material at a few colleges, so the book may have had some marginal influence. It does not really matter—human society will evolve independent of my own and most probably the predictions of others.

At times I feel grateful to a universe, which I know does not care, is not capable of caring, is not conscious, and is a dubious substitute for the God of most religions. Yet silly and contradictory as this may be, I still feel very thankful for having been able to lead a life that mixed making a decent living in an enjoyable way, and with still enough time for study, contemplation and achieving certain insights. I believe that I have also been able to contribute in a minor way to the advancement of human technology. In the past few years I have come to the realization that what I do not understand today, I will never understand. This realization makes the certainty that my rather long life will end relatively soon more acceptable to me.

I shall end this essay by quoting Einstein once more: "The most incomprehensible thing about the universe is, that it is comprehensible." To which I would like to add: We are that infinitesimal part of the universe which does that comprehending and I am a tiny speck of that infinitesimal part. This insight has made and still makes life worth living for me.